

THE MATHEMATICS CLUB FOR EXCELLENT STUDENTS AS COMMON GROUND FOR BEDOUIN AND OTHER ISRAELI YOUTH

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Abstract:

The focus of this paper is an after-school mathematics club, Kidumatica, directed towards mathematically talented and mathematically interested middle and early high school students. Since 2002, Bedouin students have been actively encouraged to participate in Kidumatica. The integrative approach adopted by the program has proven successful not only in developing the Bedouin students' mathematical inclinations and skills but also in bringing together Bedouin students with the other Israeli Jewish students in the club in a spirit of camaraderie and with a sense that, through mathematical activity, they stand on common ground. The paper also suggests that the effect of a circumscribed after-school program, like Kidumatica, which integrates indigenous students with the rest of the student population, may extend beyond the students directly involved and ultimately reach the greater community and the schools themselves. In this regard, we believe Kidumatica may provide a model for wider application in other parts of the world.

KEY WORDS: Bedouins, indigenous communities, *Kidumatica* math club, talented mathematics students

INTRODUCTION

'Mathematics for All' has been a familiar phrase within the mathematics education community for more than two decades. It has been a watchword for educational policy in the USA since the late 1980's and 1990's (NCTM, 1993, 2000), as it has been in other countries, including Israel (Amit, 1999), which is our concern in this paper. The meaning and implications of the phrase 'Mathematics for All' are not entirely unambiguous (e.g. Fried, 2003; Amit, 2002; Mukhopadhyay & Greer, 2001; Damerow & Westbury, 1985; Keitel, 1987); but whatever else it says, it expresses first of all an obligation, the obligation that no child be denied the materials, conditions, and kinds of teaching necessary for developing good mathematical thinking and the social and economic benefits deriving from it. This is clearly a social obligation, and recognizing it as a central one in mathematics education has

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caused the discipline to give greater and greater weight to questions of equity, access, and politicization (e.g. Gates, 2006; Tate & Rousseau, 2002; Mellin-Olsen, 1987; Atweh, Forgasz, Nebres, 2001; Skovsmose, O., 1994), beyond the more traditional emphases of problem-solving, learning theories, and teaching in specific content areas. Two main reasons (though there are others) account for this centrality and this shift: one is the realization that students' social, political, economic situations have a tangible influence on precisely those traditional focuses of mathematical education just mentioned (e.g. Lerman, 2000); the other, and the more pressing reason, is the painful awareness that mathematics education, to an unacceptable extent, has *not* reached all students.

Students in lower socio-economic sectors are, not surprisingly, among those who have caused scholars to surmise that the goal of mathematics for all has yet to be truly fulfilled. This is no less true in Israel as it is in other places in the world. But another sector in Israel which has deserved attention under the banner of 'Mathematics for All', one which is peculiar to the Israeli case, is that of the Bedouin population in the southern Negev region (Abu-Naja, 2006; Abu-Saad, 1997). Several approaches have been adopted to improve the level of mathematics and science education among Bedouin students. Approaches via teacher education are prominent among these, but the program that we will speak about in this paper goes directly to the students. It is the mathematics club called *Kidumatica for Youth* (hereafter, *Kidumatica*). This program, as we shall describe below, concentrates on developing mathematical thinking in students who show talent and, more importantly, interest in mathematics. But what makes *Kidumatica for Youth* particularly interesting is the way it integrates Bedouins with other Israeli students interested in mathematics; beyond language, religion, and origin, mathematical activity becomes common ground for all the students in the club. In this way, we believe *Kidumatica for Youth* may provide a framework for fulfilling the obligation of 'Mathematics for All' with respect to neglected indigenous peoples in other parts of the world.

The paper will proceed as follows. In the first section, we shall provide some general background information concerning the Bedouin population in the Negev, particularly the state of education in their sector. We shall then describe a few different programs and interventions related specifically to mathematics and science education among the Bedouins. A distinction will be made in this section between programs based within the Bedouin community and ones that integrate Bedouin students with other Israeli students. Following this, we shall turn to the *Kidumatica for Youth* program, which is a program of the latter type, and discuss its main features. With that, we shall describe the Bedouin participation in *Kidumatica for Youth*; we shall stress how their participation addresses not only their mathematical development but also their sense of inclusion within the overall population of Israeli students. The concluding section will contain some further thoughts more directly addressing *Kidumatica's* part in social justice, thoughts about the idea of common ground through mathematics, about in-school and out-of-school efforts, and some hope for the future.

THE BEDOINS OF THE NEGEV: SOCIAL AND EDUCATIONAL BACKGROUND

Although there are also Bedouins in the northern Galilee region of Israel, the majority of Israel's Bedouins inhabit the southern Negev region. The Negev comprises about 12,900 square kilometers; it is a roughly triangular region whose northern side extends from the Gaza Strip to the lower end of the Dead Sea and whose eastern and western sides follow Israel's south-eastern and western political frontiers. The Negev Bedouins originated apparently from the Hejaz area of the Arabian peninsula (Ben-David, 1999) and settled in the Negev in three waves between the seventh and seventeenth centuries, each wave displacing the previous resident tribe (Abu-Rabi'a, 2001). Having thus a 1400 year

presence in the Negev, the Bedouins may be considered, for all intents and purposes, one of Israel's indigenous peoples.

Today, there are more than 110,000 Bedouins in the Negev (Ben-David, 1999), about half of whom live in seven Bedouin towns established by the Israeli government after 1967. These Bedouin towns were set up initially so that health and other public services could be provided efficiently,² but in practice the results have fallen short of expectations: even now, the Bedouin towns exhibit the highest unemployment in the country and suffer poverty and general neglect (Bailey, 1995). It can be argued that these problems (which, it should be pointed out, exist also in the largely Jewish 'development towns' in the Negev, though admittedly to a much lesser degree) arise from the particular nature of the Israeli socio-political fabric and the Bedouins' place in it (Yonah, *et al.*, 2004); on the other hand, the failures of the Bedouin towns may also reflect, to some extent at least, the same problems typically associated with the urbanization of indigenous peoples all over the world (such as described, for example, in Fischer (1972)).

The last point is quite important, for Bedouin towns mirror the tensions ever at work in encounters with indigenous peoples, namely, those between traditional life and the forces of modernization. These tensions, naturally, are at work also in education. In this connection, the clash between traditional Bedouin community life and modern Israeli life is manifest not only in such things as family size and gender roles (compounding problems already existing with respect to gender in mathematics education) (see Abu-Saad, 1997, p.32) but in the very notion of formal schooling. For education among the Bedouins was traditionally *informal* and based on the necessities of everyday life. Where education was formal, it was the religious *Kuttab* schools, though, during the British Mandate, sons of the tribal sheiks could attend Western style schools (Abu-Saad, 1997, pp.22-23); formal education, as we think of it, then, was something belonging to the elite. With this background in mind, one can understand how the imposition of modern schools with a typical Western curriculum could pose a threat to traditional Bedouin life and values. Referring to the high drop-out rates among Bedouin students, Abu-Saad (1997), accordingly, writes, "Bedouin schools have come to represent institutions attempting to diffuse modernization within a traditional community. The emphasis on achievement, as opposed to tribal affiliation and status, is a major revolution in the Bedouin ways of life" (p.33).

The tension between traditional Bedouin life and culture and modern Western-style Israeli life is undoubtedly a component affecting the social and educational state of Bedouins in the Negev. Of course there are other components as well, related to the cultural component but not identical with it: the problem of sufficiently trained and sensitive teachers, just mentioned, is one; appropriate curriculum (Ben-David, 1994; Abu-Saad, 1997) is another; national identity and a sense of alienation (Yonah *et al.*, 2004) may be yet another. We should also mention here the poor physical condition of classrooms and large class size as adverse elements in Bedouin education (Mei-Ami, 2003) (this is a problem in the Arab sector in general, as it is in some parts of the Jewish sector). The educational state of the Bedouins is most likely the complex total result of all these components taken together rather than any one of them taken in isolation. What is clear, though, is that up to the present the educational state of the Bedouins, relative to the rest of the country, has not been good.

² Settlement of the Bedouins has also been an issue, and no less problematic, in Arab countries (e.g. Barakat, 1993, pp.53-54). We might remark that even in Ottoman times, the mutasarrif of Jerusalem Ekrem Bay also proposed the settlement of Bedouins and the registering of their lands, "as means of enhancing stability in the Negev (Abu-Rabi'a, 2001, pp.13-14), but this, as well as earlier Ottoman attempts at settlement, were never really put fully into effect.

First of all, there is a very high dropout rate among Bedouin students (Ben-David, 1994, Abu-Saad, 1997). Abu-Saad (1997), moreover, points out that girls tend to leave school during the transition from elementary to middle school, and boys during the transition from middle to high school. The high and early dropout rate is one problem which clearly does arise out of the social conditions of the Bedouin community and its cultural background; Abu-Rabi'a (2001) says this quite explicitly: "In brief, the main causes of quitting school amongst the Bedouin are social, cultural, economic, and religious-traditional" (p.103). Dropping out of school is "a critical problem among the Bedouin..." (Abu-Rabi'a, 2001, p.99); it is particularly critical for girls, since, accordingly, many are receiving only slightly more than primary schooling—and, for mathematics education, this means they are learning little more than arithmetic.

As for general educational achievement, results on the international assessment test, PISA,³ show an unacceptable gap between Bedouins (as reflected in the achievement level of the general Arab student population) and the Jewish population, already at the middle school level. And this includes mathematical achievement. Thus, Mei-Ami (2003) points out that, according to the results of the 2002 PISA examination, Israel ranked 31 in mathematical literacy and 30 in reading literacy; however, factoring out the results of the Arab students, Israel's overall rank rises to 12. How well tests such as PISA truly assess mathematical literacy has been questioned (e.g. Jablonka & Gellert, 2001), but the gap in mathematical achievement indicated by PISA can be corroborated by a similar gap between the achievements of Bedouin students and other Israeli students on the national matriculation examination, the 'Bagrut',⁴ taken by students during their high school years.

The Bagrut examinations are prominent both in the Israeli school system and in Israeli society in general (Amit & Fried, 2002; Amit & Koren, 1995). Success on the Bagrut opens the door to higher education; Bagrut grades are crucial in gaining acceptance to university as well as in determining what majors are open to students after they have entered university. Even jobs and positions in organizations often require one to have taken and passed the Bagrut. And as success or failure in school determines one's own self-view, so does the Bagrut; it is not just another examination (Amit & Fried, 2002). Therefore, despite dramatic improvement over the last fifteen years, the still low success rate on the Bagrut among Bedouin students, relative not only to the Jewish Israeli population but also to the general Arab Israeli and Druze populations, is a significant and worrying fact (Ben-David, 1994; Abu-Saad, 1997; Mei-Ami, 2003; Abu-Naja, 2006). Table 1 shows the relative success on the Bagrut ('success' meaning that a student has received a good enough grade on the Bagrut examinations to obtain a Bagrut Certificate, which is roughly equivalent to a

³ PISA (Program for International Student Assessment) is an examination given to 15 year-olds every three years by the Organization for Economic Cooperation and Development (OECD). The number of participating countries in 2003 was 41 and in 2006 was 58. The express goal of the PISA examination is to assess reading, mathematical, and scientific literacy.

⁴The 'Bagrut' include examinations in mathematics, English, Bible, history, literature, Hebrew language, citizenship, geography, physics, biology, and chemistry, among others. Of these, mathematics, English, history, Hebrew literature and language, civics, and Bible (Koran for Moslem students) are required to obtain a "Bagrut Certificate," the possession of which is, among other things, a minimum requirement for acceptance into universities. University acceptance depends also on the level of the examinations and the particular grades the student has actually received. Of course, a student who wishes to study a particular field in university may be required by the university to take additional examinations related to that field.

high school diploma) among these populations during the ten year period from 1992 through 2002.

	1992	'93	'94	'95	'96	'97	'98	'99	2000	'01	'02
Total	31.5	32.5	34.0	37.9	38.8	37.7	38.5	41.4	40.8	43.8	46.5
Jews	36.2	37.3	39.5	43.8	45.1	43.7	43.1	45.9	45.6	48.2	51.5
Druze	18.8	22.0	21.4	28.7	27.6	24.1	29.8	35.4	28.6	39.3	36.8
Arabs*	19.8	19.8	18.8	22.2	23.1	23.2	27.4	31.5	29.0	33.1	34.0
Negev Bedouins	2.5	3.2	5.1	5.7	6.0	10.3	9.6	13.1	16.8	27.7	25.9

(* Not including Druze and Bedouins)

Table 1. Percentages of students eligible for the Bagrut Certificate according to sector (Source: Shlomo Sabirski, *Eligibility for Bagrut Certificate According to Population 2001-2002*, Adva Center, August 2003).

The possession of a Bagrut Certificate is a requirement for higher education. But it is only a minimum requirement: as remarked above, one must receive a sufficiently high grade for university acceptance. Here too, one finds that the Bedouins lag behind the rest of the population. This can be seen in table 2, which shows the percentages of students who, having passed the Bagrut examinations, have received grades high enough for acceptance to university studies: while in the general population slightly more than 85% of those who pass the Bagrut qualify for university, less than half of the Bedouin students who pass are able to go on to higher education.

	1997	1998	1999	2000	2001	2002
Total	86.2	87.3	86.7	86.2	85.1	85.1
Jews	88.8	89.7	89.2	88.6	87.7	87.3
Arabs*	69.4	70.3	69.8	70.4	71.5	73.0
Druze	57.8	65.0	67.0	66.0	66.3	69.1
Bedouins in the Negev	41.2	50.0	47.5	38.4	40.7	46.8

(* Not including Druze and Bedouins)

Table 2. Percentages of Bagrut Certificate holders with grades sufficiently high for university acceptance. (Source: Shlomo Sabirski, *Eligibility for Bagrut Certificate According to Population 2001-2002*, Adva Center, August 2003).

Actual numbers from Ben Gurion University for the academic year of 2002/2003 can be seen in table 3. Among these Bedouin students who are accepted to university, moreover, one notes that few pursue or are able to pursue the advanced studies in the hard sciences and engineering. This naturally is a particularly painful datum for mathematics educators.

	Total	Advanced Degree		Bachelor Degree	
		Female	Male	Female	Male
Total	319	26	70	116	107
School of Management	11	-	9	-	2
Engineering Sciences	11	-	3	-	8
Health Sciences	40	5	8	14	13
Natural Sciences	16	-	3	5	8
Humanities and Social Sciences	241	21	47	97	76

Table 3: Bedouin Students at Ben-Gurion University of the Negev, by Degree, Gender and Faculty, 2002/2003 (Abu-Naja, 2006)

SOME EFFORTS AND APPROACHES FOR PROMOTING MATHEMATICS EDUCATION AMONG NEGEV BEDOUINS

Having examined some of the main difficulties relevant to the state of education among the Bedouin, we need to turn to efforts that have been made in light of these difficulties, particularly, efforts made to promote mathematics education. The list that follows is not exhaustive and the descriptions of the programs mentioned are brief, but it should give an idea at least of the kinds of approaches that have been adopted. In the next section, we shall consider one of those programs in more detail, namely, the *Kidumatica for Youth* program.

1. "Five-Year Plan"

In 1999, a national plan called the "Five-Year Plan" was announced: its purpose was to promote education among the Arabic-speaking population of Israel and to address the educational gap between it and the rest of the population (Mei-Ami, 2003). It was directed towards the educational infrastructure as well as the academic level of teachers and students. The plan proposed additional study hours, mostly in math and English. As part of the "Five-Year Plan," an enhancement program was also formed, a systematic evaluation scheme was set out, and a special program for the training of Arabic speaking math teachers was initiated. All these programs naturally included the Bedouin community. In retrospect, however, they were only partly carried out.

2. Teacher training –professional development

One of the central difficulties for the Bedouin community in the Negev, as we have already mentioned, is the lack of good teachers within the community. Like the proverbial chicken-and-egg, the problem begins where it ends. There are few high achievers in the Bedouin high schools, and, of these, only a small percentage of them pursue mathematics and science education. Consequently, there are few teachers to teach mathematics and science; this then creates an over-reliance on teachers from the north, who are far from the Negev Bedouin traditional culture. Moreover, these teachers tend to arrive inexperienced and return to the north before they are able to make a real impact in the Bedouin schools in the south (Ben-David, 1994; Abu-Saad, 1997; Abu-Naja, 2006).

One program addressing this problem, especially for elementary and middle school teachers, was the creation of an in-service mathematics education program for Bedouin teachers. The "Teacher-Professionalization Program," as it was (uninspiredly!) called, was created shortly after the initiation of the "Five-Year-Plan"; it shared the motives and spirit of the "Five-Year-Plan," but it was essentially an independent effort. Once a week, over the course of three years, participating Bedouin teachers studied both mathematics and mathematics education from a theoretical as well as practical point of view. The rationale of the program was that by working over a relatively long term with local teachers, exposing them to a wide range of mathematical and educational issues, a stable and high-quality nucleus of mathematics education in the community could be created and be self-sustaining. The design and rationale of the "Teacher-Professionalization Program" was modeled roughly after another program, *Kidumatica for Teachers*. It is worth mentioning *Kidumatica for Teachers* (described in Fried & Amit (2005) and Amit & Fried (2002)) here, for although it was not specifically for Bedouin teachers, Bedouin participation was actively encouraged. In fact, many Bedouins did participate and studied together with other Israeli teachers as equals; in this sense, *Kidumatica for Teachers* anticipated the integrative approach of its namesake, *Kidumatica for Youth*, which will be discussed below.

3. Upgrading Bedouin Teachers through Advanced Degrees

Ben Gurion University of the Negev, besides being one of Israel's major universities, is the only university in the southern region of the country. Its geographic location in the Negev is part of its identity: serving the Negev region is central to its mission, and, with that, the university has made efforts to encourage Bedouin matriculation into the university and educational development within the Bedouin community. The establishment of the university's Center for Bedouin Studies and Development is a concrete example of such an effort; many of the efforts summarized in this section, however, are also connected one way or another to Ben Gurion University.

A less obvious, but no less important, example of how Ben Gurion University encourages the development of mathematics education in the Bedouin community is the graduate program mathematics, science, and technology education. In general, the program aims to improve the quality of science and mathematics teachers by means of studies towards master and doctoral degrees, while taking into account the previous background of the teacher-student. (the premise-bridging the gap between practice and theory). In recruiting students for the program, a special effort is made to reach Bedouin students. Currently, approximately one third of the students in the program are Bedouin. It is worth mentioning too that the first Bedouin to finish a PhD in mathematics education is a graduate of Ben-Gurion's program; he also happens to be one of the authors of this paper (and his former advisor, another of its authors), which gives testament to the success of the program.

4. "Buds of Science"

Nitaznei Madaa, which means "Buds of Science," was set up in several Bedouin settlements in the Negev with the help of the Center for Bedouin Studies and Development at Ben Gurion University of the Negev. Bedouin pupils from grades 10-11 meet throughout the year with students of natural sciences who come to the Bedouin towns and work with the pupils on aspects of biology, chemistry and physics (the program does not include mathematics). The prime aim is to increase the number of young Bedouins who turn to these subjects after finishing high-school; in the background is the poor achievement of Bedouins on the Bagrut examinations and the meager numbers of Bedouin university

students studying the sciences and engineering, which we discussed in the last section. The program has been in existence for about four years, and the level of its success is presently being evaluated.

Another recent program worth mentioning, which was initiated also by the Center for Bedouin Studies and Development, is the "Year of Excellence in the Engineering & the Natural Sciences." Overall, the goals of this program are similar to "Buds of Science," except that it is directly concerned with preparing Bedouins, who have finished high school, for entrance into the university science faculties. It is notable that all books and other material are provided to the students free of charge.

5. "Accessibility to Higher Education"

This program, which has been running for three years now, tries to reach Bedouin high-school students with scientific leanings by bringing them to the university one day a week to enrich their knowledge in natural science, mathematics and technology. The program also helps develop students' knowledge of English—one must not forget that English is the academic *lingua franca*, and, for Bedouin students (and for many other Israeli students), lack of English knowledge is a major impediment to studies in all fields, scientific as well as humanistic. Unlike "Buds of Science," "Accessibility to Higher Education" is not directed exclusively towards Bedouin students: like the teachers in the *Kidumatica for Teachers* and the young people in *Kidumatica for Youth*, Bedouin and Jewish Israeli students study together. It must be emphasized, however, that the mix of Bedouin and Jewish students is an express goal of the program (see Saroussi, 2006). One can discern two basic tendencies in these programs and approaches. Programs such as the *Kidumatica for Teachers* and *Accessibility to Higher Education* bring Bedouin students or teachers into a greater circle of Israeli students and teachers; they improve by focusing on the entire community of mathematics students and teachers and making Bedouin improvement part of the general effort. Thus, it is appropriate to call such efforts *integrative*. Programs such as the "Buds of Science," on the other hand, treat the Bedouins *apart* from other Israeli students, and, here even more so since the activities take place *within* the Bedouin towns. It is right, therefore, to call this kind of effort, *non-integrative*. Integrative and non-integrative approaches, of course, each have obvious advantages and disadvantages. Non-integrative approaches can take into account the Bedouins' particular needs and place them at the center of the effort; however, they may unwittingly further a state of "segmentation" between the Bedouin and Jewish populations in the Negev. Integrative efforts cannot focus single-mindedly on the Bedouins' needs: they will invariably take place in Hebrew, which is the common language, but not the Bedouins' first language; they are not pursued in a setting in which the Bedouins necessarily feel at home. But integrative efforts have the advantages of forming a community of learners and creating a sense of cooperation. These advantages provide strong counterweight to the disadvantages, for they relate to the society as a whole while strengthening each part of it. Let us now turn then to *Kidumatica for Youth*, which is an effort of this integrative type.

THE KIDUMATICA FOR YOUTH PROGRAM

Kidumatica: General Background

Ben Gurion University's *Kidumatica for Youth* (hereafter, *Kidumatica*) was established in 1998 by one of the authors of this paper. Its goal was to create an after-school program in

which students from 7th-10th grades⁵ could develop their interest in mathematics and their mathematical thinking. Initially, the program was directed towards students in the immediate Beer Sheva area and included about 120 students. Since then it has greatly expanded and now includes almost 400 students.

Once a week, at the university campus, students participate in several "mini-courses," each constructed and led by highly trained mathematics educators. Mini-courses in the past have included: "Logical Problems," "Real-Life Mathematics," "Mathematical Games," "Number Theory," "Algebraic Techniques," "Number Sequences," "Fractals," and "TRIZ" (Theory of Inventive Problem Solving). Once a month, an "activity day" takes the place of the usual courses. During the "activity day," the students take part in mathematics competitions and games, work on the *Kidumatica* newsletter, and listen to special guest lectures on special topics in mathematics, including history of mathematics. It should be underlined that, the lectures aside, all the activities on "activity day" are group activities dependent on high degree of teamwork and cooperation; developing a collaborative attitude in mathematical work is, in fact, one aim of the program—and it has borne fruit in the form of success in national, and even international, "Mathematical Olympiads," which typically demand this kind of teamwork. Most of the students and staff refer to the program as the "Mathematics Club," which further attests to the collegial spirit of *Kidumatica*.

The teaching staff, as we said, consists of highly trained educators: several of the teachers teach as well in middle schools and high schools and some at the technical colleges and university. The majority of the *Kidumatica* teachers are from the former Soviet Union, but not all, and there is now also a Bedouin teacher in teaching staff from one of the Bedouin towns (he quipped recently that his Russian has improved since he joined the staff!). Besides the main teaching staff, moreover, there is a group of upper-level high school students and university students who work as tutors and help with many aspects of the program. Although, during the first few years of *Kidumatica*, these student-tutors came from outside the program, most now are "graduates." This is a very significant side of the program, for, we believe, it makes students aware of their potential for helping other students in the future, that is, for continuing the educative work of *Kidumatica* itself.

To be accepted to the program, students do have to pass a selection examination; however, it must be stressed that the examinations is more a tool for the staff to evaluate the mathematical talent⁶ of the entering students than to eliminate students. The truth is, although the great majority of *Kidumatica* students are talented, there *are* weaker students in *Kidumatica* as well. Maintaining the popular character of the program was an extremely important principle in the conception of the program: it aimed to discover and develop the talents of a wide range of students interested in mathematics, not to cater to an elite.

Bedouin Students in Kidumatica

The inclusion of Bedouin pupils in the mathematics club *Kidumatica* has created three important precedents:

1. It is the first program that deals specifically with excellence in mathematics in the Bedouin sector.
2. It is the only mathematics program that actively integrate Bedouin and Jewish pupils.
3. Bedouin girls are present in significantly large numbers (about 40%)

⁵ There are now some students in the 11th grade as well.

⁶ More on the identification of mathematical potential in the context of *Kidumatica* can be found in Neria & Amit (2006).

The decision to include Bedouin pupils was made in 2002, specifically, with an eye to create equal opportunities for everyone and with the firm belief that gifted young people among the Bedouins were sure to be found. This belief has been born out: today, four years later, 60 Bedouin boys and girls annually participate in *Kidumatica* on a regular basis, constituting over 15% of the club's members. Two of the Bedouins students compete regularly in *Kidumatica's* top mathematics Olympiad team, and others have taken part in local and state competitions. Most of the pupils come from the Bedouin town of Kseifa and from scattered settlements in the eastern Negev; there are also a number of pupils from the Bedouin towns Lakiya and Tel Sheva. The pupils are from the 8th to 11th grades; all attend high-schools or junior high-schools in Bedouin towns. That approximately 40% of the participants are, at present, girls represents a remarkable, and, we might add, welcome, change in traditional attitudes towards girls' education in Bedouin society.

The Bedouin pupils are quite committed to the program. Statistics collected annually show that Bedouin attendance and participation exceeds that of any other group. Their attendance percentage is 95%, and their dropout rate is 0%. The pupils' commitment to *Kidumatica* is so strong, in fact, that there have been cases where pupils stayed home from school because of illness or to help their parents, and yet, they still came to the club in the afternoon. (This is a contrast to well-documented low attendance in school by the Bedouin pupils in general). The Bedouin attendance and participation statistics are all the more striking in light of the sheer physical difficulty of getting to the program. The students are taken to the university by busses (the transportation is funded in part by the Society for the Promotion of Coexistence and Ben Gurion University's Center for Bedouin Studies and Development, mentioned above), and the trip for some of pupils from the more distant villages can be an hour long. But there is an additional difficulty: many of the pupils live in places inaccessible by bus and must walk nearly an hour to the bus stop. Moreover, because the club is an after-school activity, the equally lengthy trip home means these pupils return to their village or town quite late at night.

Recruitment and Promotion

When the decision first made to extend *Kidumatica* beyond Beer Sheva and to the Bedouin communities, an information campaign was carried out both in schools and among families (we shall return later to the family's role) in order to encourage pupils to attend the selection exams. Since then, *Kidumatica* has become known widely among the Negev Bedouins and there has been much less need for intensive publicity.

At this point, pupils are found mostly through their schools and their teachers' recommendations; but children are also invited to come to the selection exams on their own initiative. In the selection process, every measure is taken to locate true mathematical potential and to eliminate any biases that might arise from language ability or socio-economic background (in Bedouin society there is also more than one socio-economic stratum). To this end, all questionnaires have been carefully translated into Arabic by a mathematics teacher, and Arabic-speaking students are present during examination to answer any questions regarding language or reading comprehension. The questionnaires are also checked afterwards by Arabic-speaking mathematics teachers (the questions are open and often require explanations and justifications).

Language, Culture, and Common Ground

Although the selection examination for *Kidumatica* is given both in Hebrew and in Arabic, Hebrew is the language of the program itself. But mathematics teaching in Bedouin schools, like that of all other subjects, is conducted in Arabic: therefore, even though the

Bedouin students learn Hebrew as a second language, it was thought that all mathematical activities and teaching in *Kidumatica* being only in Hebrew might impede the Bedouin students from taking full advantage of the program. For this reason, it was decided bring in, right from the start, two Bedouin university students to work as tutors—eventually, as we described above, Bedouin tutors will be recruited from among the graduates of the program. The Bedouin student-tutors are present in all classes having a large group of Bedouin pupils: when needed, they translate, explain terminology, and provide moral support.

The language difference was certainly a potential focus for tension between the Bedouin and Jewish students. As it turned out, in five interviews conducted with the Bedouin *Kidumatica* students, not one of the students referred to Hebrew as a drawback; and, interestingly enough, two of the students cited the opportunity to improve their Hebrew precisely as one of the attractive and beneficial aspects of the program. They saw Hebrew as a way of improving their chances for success in the university—indeed, they connected the program very much with the university—and they saw this as something to be gained in *Kidumatica* more than in regular school. Thus, in the interview with one of the two students just mentioned, a 9th grade girl whom we shall call here Sana, we had the following short exchange:

Interviewer: Is there any difference between the mathematics in the Club [*Kidumatica*] and the mathematics in school?

Sana: There's an enormous difference, really enormous!

Interviewer: Like what?

Sana: At school we stick to the books and I feel I am limited. At the Club, there is something different, something new every week—not like school.

Interviewer: Is there anything particularly special about the Club?

Sana: Yes.

Interviewer: Like what?

Sana: At the university [referring to the Club as the university itself] the teachers teach me in the Hebrew language and I think that gives me an opportunity to study both Hebrew and mathematics!

That no tension arose with respect to language might merely be a sign that the Bedouin students recognize the necessity of Hebrew in modern Israeli life; but we believe that it also indicative of the general atmosphere in *Kidumatica* of cultural tolerance and respect. The complete and thorough integration between Bedouin and Jewish boys and girls is one of the distinctions of this project. The Jewish pupils themselves are not a homogenous group: they include new immigrants and natives, religious and non-religious, Ashkenazi and Sephardic.⁷ The Bedouins are just part of the fabric: Bedouin girls' wearing traditional clothing and socializing with kids wearing jeans disturbs no one and is taken for granted. The Bedouin pupils participate in all the social activities, including extended day-long activities, competitions, field trips and museums visits. In competitions, the competing teams are typically mixed, Jews and Bedouins against Jews and Bedouins, creating a camaraderie that goes beyond culture and descent. (In the interviews with the Bedouin students, we found only one comment contradicting the sense of equality which *Kidumatica* tries to promote: it was a remark by an 11th grader that vacations are only during the Jewish holidays--a small remark, as the student himself put it, but one which shows there is still work to be done.)

⁷ Roughly speaking, Ashkenazi Jews are those with European backgrounds, while the Sephardic Jews are those with backgrounds in North Africa, the Middle Eastern Arab countries, and Iran.

The atmosphere of tolerance in *Kidumatica* may well be, in part, a result of its subject being mathematics and of the students' and student tutors' own views of what mathematics is. They tend to see mathematics as cultureless or in some way transcending culture. Thus, one of the Bedouin tutors told us that "it's easier to work together in mathematics than in other subjects because the arguments are about math and not about everyday things or politics which are more charged..." Another tutor said that "when arguing about mathematics, opinions are not divided according to Jew and Arab, but by mathematical opinion only..." There is no basic position regarding the cultural or cultureless nature of mathematics maintained by the staff and initiators of *Kidumatica*, but there is a recognition that while tolerance means affirming commonality it equally means respecting difference. Thus, when the opportunity arises, special attention is drawn to mathematics from Islamic world as well as problems unique to Bedouin society such as "the camel inheritance problem" which can be related to the complex Islamic inheritance laws.

Family support

Family is a central pillar of Bedouin life, indeed, of all traditional Arab life. Patai (1976) relates this to the specifically Bedouin concept of kinship spirit or tribal loyalty, *'aṣabiyya*:

While *'aṣabiyya* is thus, in the first place, a Bedouin tribal trait, it was carried over from nomadic to settled Arab society in the form of family and lineage cohesion. Kinship ties, and primarily family bonds, are extremely strong in all sectors of traditional Arab society. They remain an influential factor even after members of a group have moved away from the family home and lived for years in a faraway city or even overseas. (p.94)

Family involvement and encouragement for the Bedouin *Kidumatica* students is, accordingly, crucial: without it, it is safe to say, the activities would be impossible. At the beginning of each year, we meet with the parents of our Bedouin pupils (it is telling that the meetings are attended only by fathers, though 40% of the pupils are girls). The atmosphere is very supportive and the parents are very proud of their children's inclusion in the club. We hold open discussions at these meetings, mostly in Hebrew, but some also in Arabic. These discussions clearly have shown that the parents themselves place much weight on promoting mathematical excellence. Thus, in one such discussion held in the town Kseifa—which, incidentally, was also attended by the head of the education department, a Sheik and other important members of the community—one father said, "it could lead to a good, profitable profession in the future". Others at the meeting pointed out that studying in the program would make the final exams easier for their kids, and later also help them get into universities, help them get a better start. Comments such as these were made also in conversations with Jewish parents. But there were other comments that related directly to the Bedouin community and Bedouin perceptions of themselves. Many, for example, mentioned that since Bedouin students begin university at a young age (about 3-4 years before Jews),⁸ it is important to begin their intellectual development at young age. In a particularly poignant moment, a father said, "Good for you! [addressing the head of the program] Everyone thinks Bedouins are stupid [sic.]: now you understand that there are smart Bedouins, and other people will also see that we have really smart kids..." The parental support demonstrated at these meetings has been corroborated in every interview with the students.

⁸ Jewish boys and girls are obliged after their 18th birthday to serve in the army (2 years for girls and 3 years for boys) or, in some cases, do non-military national service. Bedouins may volunteer for the army, and among the Bedouins in the north of the country, many do: Negev Bedouins, however, generally do not. Therefore, Bedouins that attend university typically begin earlier than the Jewish students.

To summarize this section, the primary aim of *Kidumatica* was to provide students talented and interested in mathematics an opportunity to broaden their mathematical experience and develop their mathematical thinking. The commitment to "Mathematics for All" meant that so long as our Bedouin students were not provided with this same opportunity the aim of *Kidumatica* would not truly be fulfilled. The inclusion of the Bedouin students proved successful both in their mathematical attainments and—the aspect we emphasized here—in their total integration with other like-minded Israeli students, with whom they would otherwise have had little contact. The success of the program was given further foundation by the unambiguous encouragement by the pupils' parents and community—this was especially pointed in the case the Bedouin girls. We also ought to mention that integration is never a one way street. Just as the Bedouin students were able to feel their own mathematical power among the other Israeli students and interact with them intellectually and socially, the Israeli students also benefited: many of their stereotypes of Bedouins were challenged, and they could see that, as the father mentioned above put it, "there are some really smart [Bedouin] kids..."

CONCLUDING THOUGHTS

By integrating Bedouin students and other Israeli students into a single community, by having all these students together engage, as colleagues, in mathematical activities, competitions, discussions and collaborative problem-solving, by creating a setting whereby Bedouin boys *and girls* can recognize their own mathematical power, so important in modern life, and a setting whereby other Israeli students can recognize the concrete and potential contributions of their Bedouin neighbors, by allowing friendship between Bedouin and Jewish Israeli students to grow on the common ground of mathematics, *Kidumatica* shows the possibility of a mathematics program that, while it develops mathematical thinking, is also deeply committed to social justice. Its framework shares, in fact, many of the same foundations as democratic societies built on social justice. Hytten (2006) in a piece about education for social justice lists such foundations as follows (referring to the work of Michael Apple and James Beane):

We create the conditions for a free exchange of ideas, even when these ideas are unpopular, thus allowing us to make fully informed decisions; we have faith in our fellow citizens and in our ability to work collaboratively with them to solve problems and to imagine more enriching possibilities for living together; we employ habits of critical thinking, reflection, and analysis to assess ideas and options, instead of relying on narrow prejudices, uninformed opinions, and personal biases; and we are all concerned with the rights of individuals, the treatment of minorities, the welfare of both intimate and distant others, and, ultimately, the advancement of the common good. (p.221)

That mathematics forms the basis of *Kidumatica* is not, we believe, incidental to the program's success in promoting these democratic values. Whether mathematics is culturally neutral or itself a product of cultural can be argued. Our own view tends in the direction of its being cultural. In the present circumstances, though, this makes it all the more common ground for our Jewish and Islamic Bedouin students, for, historically, western mathematics is what it is largely because of Islamic mathematics. Also applications of mathematics in Jewish and Islamic traditions are both often derived from interpretations of the religious laws of each—for example, in the mathematical-astronomical calculation involved in constructing workable calendars—so that, even where different, a bridge can be found from one culturally related expression of mathematics to the other.

Yet, it is not chiefly those commonalities that make mathematics common ground for our Jewish and Bedouin students, nor is it those that we rely upon in the program itself. Rather, we think, it is that the practice of mathematics, especially mathematical problem-solving (which is so much a part of *Kidumatica*), is such that it demands listening to criticism, recognizing a good idea no matter its source—rich person, poor person, Bedouin, or Jew—working together to get at the bottom of a conundrum, and most of all entertaining the possibility that one may be wrong. Mathematical practice, as scientific practice generally, can be, in this sense, a source of democratic values. That tolerance and social justice are themselves desiderata of mathematics and science was the point of Jacob Bronowski's well-known work, *Science and Human Values* (Bronowski, 1965). There, he wrote:

The society of scientists must be a democracy. It can keep alive and grow only by a constant tension between dissent and respect; between independence from the views of others and tolerance for them (pp.62-63).

And he went on to say that "In societies where these values [justice, honor, and respect] did not exist, science has had to create them" (p.63). Bronowski may have been overly-zealous in his belief, but it can be said at least that the nature of mathematical practice is fertile ground for the growth of tolerance and democratic values that we strive to inculcate in *Kidumatica*.

So, it can be said with some confidence that the design of the *Kidumatica* program and the nature of its activities do point to a program that serves social justice. But here we must face a question—and, perhaps, a dilemma. The question is whether *servicing* social justice is enough to be a true *vehicle* for social justice? The dilemma lies behind the question and has to do with the obvious fact that *Kidumatica*, as well as several of the other programs mentioned above, is a program taking place *outside* the usual school setting; indeed, it is nearly inconceivable *in* the school setting. On the other hand, school is the central public institution for education: what happens in the schools affects the whole population of Bedouin children; what happens in *Kidumatica* affects, on the face of it, less than a hundred. And school is certainly the locus for most of the educational problems described in the first section of this paper. But, as we said, the kind of activities and framework that make *Kidumatica* successful are hardly possible to implement in the schools, while solutions that are plausible for the schools generally involve great expense and more time than we can afford—even where budgetary allowances are made, the distribution of resources thus made available is a complex and problematic process (Adler, 2001). So the dilemma put baldly, and perhaps over-simply, is between a program that accomplishes much, but reaches few, and schools that reach many, but have limited or problematic options.

The dilemma is really that arising from the conflicting advantages and disadvantages of integrative and non-integrative approaches, described at the end of the second section. Of course, one might say, legitimately, that the dilemma is not a true dilemma since both approaches can be adopted simultaneously—and, ideally, should. We do not dispute this. But, in practice, especially when funding is limited, one must often choose or at least lend one's support to one kind of program or the other. And in this regard, we believe a good case can be made for an integrative program, like *Kidumatica*.

The advantages of the program for the Bedouin and Israeli *Kidumatica* students themselves, we hope have been made clear enough. Naturally, *Kidumatica*'s small budget relative to that of a large scale school program is another obvious advantage. But what makes us believe that a program like *Kidumatica* can actually be a *vehicle* for social justice, and not just be related to it in some very limited fashion, begins with the conversations with Bedouin parents described above. In our account, we remarked that at the meeting at Kseifa not only the fathers of the Bedouin students were present but also a Sheik and other

central figures in the community: the pride and encouragement expressed by the parents of the *Kidumatica* children were also the pride and encouragement of the community as a whole. In an interview with a 9th grade girl, whom we shall call Nuha, we asked what her friends thought about her participating in *Kidumatica*. She replied: "When I speak about the Club with my friends they get interested and hope they can join too." The point is that the effect of *Kidumatica* does not remain among the participating students themselves. It extends to friends at school and the community as a whole. In effect, the participants in a program, in a club, like *Kidumatica*, belong to *two* communities and thus they become like emissaries from one to the other. This, then, is a solution to the dilemma: an integrative program like *Kidumatica* reaches few students only at one level; by way of those students it reaches many more and the schools themselves. If, ultimately, the students return to their home communities as teachers, then, that would be a true consummation of the process. But even without that, we can see that the positive effects of a program like *Kidumatica* will not necessarily stay locked within it: the discovery of one's own mathematical power, the recognition that collaboration can bring genuine results, the sense that regardless of whether one is a Bedouin or a Jew one can be worthy of respect—and friendship. It is the possibility that these good effects can spread beyond *Kidumatica* gives us hope for the future.

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